

EDITORIAL MESSAGE

Guidelines for sustainable management of groundwater inflows and geothermal heat in tunnels

Developed by members of the GESTAG (GESTione Acque in Galleria – Management of Water in Tunnels),

Working Group of IAH (International Association of Hydrogeologists) Italian Chapter

In December 2020, a volume in Italian was published, by Associazione Acque Sotterranee, on the management of groundwater and heat in tunnels; since then it has enjoyed a success that justifies republication. In this new edition, apart from the translation into English, some changes have been introduced, with more attention being paid to heat-related issues and to other energy geostructures, and less to the Italian regulatory framework. This volume is the result of work by a group of experts whose names are specified in the introduction, each of whom has been dealing with a common problem from a different perspective on a daily basis. The group's diversity and its members' resulting multidisciplinary approach add to the value of the work, given the experts' areas of interest and also their different affiliations within academic, professional, business and public bodies.

The overall aim of the volume is to provide a tool permitting an integrated understanding of a set of processes and problems as a basis for enabling others in the field to then undertake studies, conceptual modelling, investigations, projects, monitoring, short and long-term mathematical modelling, forecasts and scenarios of environmental impacts, design of prevention and/or compensation and/or mitigation measures, contingency plans, etc, in the best possible way. The volume is dedicated to the management of groundwater and geothermal heat in tunnels, but can also be seen as an example of an analytical approach applicable to the programming, planning or design of other infrastructural or civil works in general.

In addition to absorbing the general analysis and specific contributions in the volume, it is hoped readers will be stimulated to read between the lines and take a leap forward in the direction of furthering their knowledge on this subject, or transferring their skills, or being inspired to develop a different approach to the next job. In this sense it is superfluous to dwell in this Preface on primary and secondary objectives, or on the target and the contents of these Guidelines, which are contained in the text; rather it is worth imagining its natural future development, beyond these Guidelines or perhaps simply looking forward beyond this edition.

This volume deals with groundwater and heat in the subsurface, addressing both elements with the clear intention of enhancing two resources whose potential is often underestimated. In this sense, it is clear for example that a

cost-benefit evaluation aimed at assessing the water resources and geothermal potential of an area affected by a tunnel project which is already in the phase of preliminary design and analysis of alternatives, should be able to identify the capital gains linked to the aforementioned evaluation; this concept could be applied to initial sustainability analyses of many other works.

The valorisation of heat is dealt with mainly by referring to its general principles, but it would be possible in a second phase or in a future edition to develop the same analyses, considerations and principles by analysing and comparing different contexts, as well as to apply the same evaluations to various works such as mines. Other applications could involve transferring the principles of thermal energy valorisation to hydraulic energy, when working on reservoirs, or the field of tunnels, rethinking the valorisation of waste materials produced by excavation works.

In conclusion, thanks are due to the organizations that have made this work possible: the Italian Chapter of IAH (International Association of Hydrogeologists), which proposed and edited it, and the Associazione Acque Sotterranee (ANIPA affiliate and publisher of this Journal), which made publication possible. The volume represents the outset of a journey of shared ideas and resources and of a search for common denominators, which I hope will be profitable, replicable and lasting.

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... and in this issue.....

In this issue, we publish four more peer-reviewed papers from the Flowpath2021 Congress, held in Naples (Italy), December 1-3, 2021. These contributions span from testing the use of RaDAR produced weather data to estimate water budgets, to the application of a new mathematical model to calculate the hydrological budget at national/sub-national scale, to descriptive statistical analyses of long-term time series of groundwater levels, to experimental investigations of karst systems. Braca et al. (2022) present a mathematical model (BIGBANG) to compute the hydrological budget components at a national and macro-regional scale. Then, a comparison highlighting the differences between the estimation of the long-term annual average of the aquifer recharge and surface runoff components, at national and sub-national levels in Italy, was carried out. Egidio et al. (2022) performed analyses on long term time-series of groundwater levels of a phreatic aquifer in an agricultural district characterised by paddy fields, in the eastern part of Piedmont (Italy). They found contrasting trends with increasing water table at some points, and decreasing at some others, even in a small area of about 500 km². Di Curzio et al. (2022) evaluated the use of the weather RaDAR data as an alternative or to integrate traditionally gathered meteorological data to estimate aquifer potential recharge in the Majella massif (Italy). Finally Nicolini et al. (2022) investigated, using the tracer masse balance method, the Fiume-Vento karstic complex (Italy) characterised by sulfuric acid speleogenesis type in order to understand groundwater circulation and dilution phenomena.

The Editors in Chief

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